BERMUDA FUNGI

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It is often stated by those who have visited the islands that there are no fungi in Bermuda, at least none to speak of. It is difficult to account for the prevalence of this idea unless it be that many of the larger forms which one is accustomed to see in other places are conspicuous by their absence in Bermuda, or if they do occur, being short-lived, they are overlooked by visiting botanists. Many of the fungi are at best so evanescent in their occurrence that it is difficult to form an adequate conception of the fungous flora of any region unless the place is visited frequently at different seasons of the year or for an extended period of time. Even then the region must be gone over with a "fine comb" in order to get a fair representation of the smaller and more inconspicuous species.

Whatever explanation may be offered, on account of the reputation which these islands have had, so far as their fungous flora is concerned, they seem to have offered no inducement to mycologists. Or perhaps this phase of their natural history has been overshadowed by the opportunities which are afforded for the study of other cryptogams such as marine algae; at any rate the fungi have received very little attention. Twenty-four species were recorded in the report of the Challenger Expedition in 1883. Professor Farlow has collected and described a few species. In addition to these published records about forty species were collected by Dr. and Mrs. B. O. Dodge during a recent visit, many of which were duplicated during our own visit to Bermuda at a later date.

The parasitic fungi, which on account of their economic importance are the first to attract attention, are quite abundant and their number is gradually increasing, largely by importation, as the work of agriculture and horticulture is becoming more extended in this region. From the observations based on a two weeks' collecting trip (November 29–December 14, 1912), the writer is

inclined to believe that the fungous flora of Bermuda, so far as the number of species is concerned, compares very favorably with that of any other region of equal extent, notwithstanding the fact that many of the familiar forms seem to be lacking. Of the one hundred and fifty species collected during our two weeks' visit to the islands, many are still undetermined and as this collection must necessarily represent a very small percentage of the species which actually occur, any report which may be presented at the present time must at best be regarded as only preliminary to the study of the fungi of these interesting islands.

Only three species of the Phycomycetes were found. Among the Peronosporales, or white rusts, *Albugo candida* (Pers.) Roussel, was the only species collected. This species, as might be expected, was found to be common on leaves and stems of cultivated radish. The Mucorales were found to be represented by *Pilobolus crystallinus* (Wigg.) Tode and an unnamed *Mucor*.

Four species of the Helvellales were collected. Of these one species, *Geoglossum nigritum* Cooke, was found to be abundant on rocky hillsides among mosses. *Trichoglossum hirsutum Wrightii* Durand was also found. This variety of "hairy earth-tongue" was described by Durand in his recent monograph of the Geoglossaceae. The variety was based on two collections made in Cuba by Wright. At the time of the original description of the variety it was predicted by the author of the variety that it would probably prove to be a distinct species. The material collected in Bermuda according to a communication from Durand has served to confirm this suspicion. *Trichoglossum hirsutum* (Pers.) Boud. was reported by the Challenger Expedition as occurring in Devonshire Marsh. Although this region was searched diligently we were unable to duplicate the collection of this species. The fourth species collected consisted of only two plants about 1 cm. in height. While this minute species is distinct from either of the other three collected, the species is in doubt and will probably remain so until more abundant material can be collected.

Twenty-one species of the Pezizales were collected which have been assigned specific names. Of these one species, *Ascophanus bermudensis*, is described as new. This species is most closely related to *Ascophanus sarcobius* Boud., a species which was also found to be common in the Bermudas, but the two appear to be

distinct in spore characters. Perhaps the most interesting fact in regard to the discomycetes of the Bermudas was the collection of several European species, which so far as the writer is able to learn have not previously been known from North America.

One of the most interesting of these is *Detonia Planchonis* Boud. a small purple cup-fungus about 1 cm. in diameter. This species was found on damp soil by roadsides and on bare soil in fields throughout the Bermudas. While this is the commonest cup-fungus in the islands and is large enough to be easily seen, there is no record of the species having been previously collected either in Bermuda or elsewhere in North America.

Another species of equal interest is *Sarcoscypha minuscula* Boud. On account of its small size this species might easily be overlooked. The species was originally described from material collected in Portugal on dead foliage of cedar. The species while not abundant was frequently collected and there is no record of the species having been previously collected in North America. Among the peculiarities of this species are the asci, which are marked by an external thickened ring near their apices. This gives to the ascus when seen in profile the appearance of having two minute ears. This structure of the ascus is very different from that of *Streptotheca*, in which genus the thickened ring about the ascus projects inward instead of outward.

Of the more common species of discomycetes, we were interested in noting the occurrence of *Pyronema omphalodes* (Bull.) Fuckel on burnt places. This species, which has proved to be of unusual interest to morphologists, appears to have a very wide distribution. The coprophilous discomycetes were found to be common and quite abundant. A number of species of the Hysteriales and Phacidiales were collected, five of which have received specific names.

The Perisporiaceae or "sooty moulds," which are essentially tropical fungi occurring as parasites or epiphytes on the leaves and stems of the higher plants, were found to be quite abundant. Since in many cases the mycelium occurred without any trace of perithecia, it was impossible in such cases to make specific determinations. Four species have been definitely determined.

Eight species of the Hypocreales were collected, three of which are described as new. One of the new species is *Nectria Lantanae*, a minute species which was found to be common on the dead leaves

of *Lantana odorata*. Whether the mycelium of this fungus attacks the leaves while living, it was impossible to determine from field observations. The other two new species were *Calonectria Umbelliferarum* and *Calonectria granulosa*, the former occurring on dead stems of *Foeniculum* and the latter on dead stems of *Jasminum*. Both appear to be saprophytes.

The Pimetariales or coprophilous pyrenomycetes were found to be represented by seven species which have been found to be determinable, and the Sphaeriales by thirteen species, none of which are of any especial interest.

The fungi imperfecti were found here as elsewhere to be very abundant and on account of the parasitic habits of the group will doubtless prove to be of considerable economic importance. Fourteen species have been specifically determined and a considerable number referred to the genera only.

Two species of the Ustilaginales or "smuts" have been reported, *Ustilago Zeae* (Beckn.) Unger, collected by Dr. Dodge, and *Ustilago Carbo* Tul., reported by the Challenger Expedition.

The Uredinales or plant "rusts" are known to be represented by nine species, some of which have been introduced with cultivated crops. Of this number one species, *Puccinia Cladii* Ellis & Tracy, has proved to be of especial interest according to Dr. J. C. Arthur, who very kindly determined the plants of this group. This species was formerly known only from the type collection which was made in Mississippi several years ago. The Bermuda material has added a new host and locality and also furnished material which has enabled Dr. Arthur to complete the description of the species in a much more satisfactory manner than would otherwise have been possible.

The Basidiomycetes, or so-called higher fungi, although not so abundant as in other regions, were found to be fairly well represented. The group has not been intensively studied and only thirty-two species have been assigned specific names, including several of those reported by the Challenger Expedition. The plants of this group were determined by Dr. W. A. Murrill.

The slime moulds, which are often included with the fungi, were found to be represented by a number of species, most of which have not been critically studied.

From the studies which have been recently made on the fungi

of Bermuda, four species of ascomycetes and two basidiomycetes have been revealed which are described as new, one variety has been raised to specific rank and a number of European species have been found which were not previously known from North America. The following is a list of the species collected, so far as they have been named:

PERONOSPORALES

Albugo candida (Pers.) Roussel. On living leaves of cultivated radish.

MUCORALES

Pilobolus crystallinus (Wigg.) Tode. On horse dung.

Mucor sp. On heavily fertilized soil.

HELVELLALES

Geoglossum nigritum Cooke. On rocky hillsides among mosses.

Trichoglossum hirsutum (Pers.) Boud. Reported from Devonshire Marsh.

Trichoglossum hirsutum Wrightii Durand. On rocky hillsides among mosses.

Geoglossum pumilum Winter? On damp soil in woods.

PEZIZALES

Lamprospora Planchonis (Dun.) Seaver. On damp soil. Common.

Pithya Cupressi (Batsch) Rehm. On dead foliage of Bermuda cedar.

Lachnea pulcherrima (Cr.) Boud. On excrement of cows.

Lachnea theleboloides (Alb. & Schw.) Gill. On excrement of cows.

Ascophanus sarcobius Boud. On the excrement of cows.

Ascophanus bermudensis Seaver sp. nov.

Apothecia gregarious or scattered, at first subglobose, expanding and becoming subdiscoid, reaching a diameter of 1–2 mm., white or more often with a delicate pinkish tint; hymenium at first slightly concave, becoming plane, finally convex, roughened by the protruding asci, similar in color to the outside of the apothecium; asci clavate, reaching a length of 325 μ and a diameter of 35–40 μ, 8-spored; spores 1-seriate or partially 2-seriate, or occasionally irregularly disposed, at first smooth, becoming rough, 33–38 $\mu \times$ 23–25 μ; spore-roughenings assuming the form of scat-

tered protuberances which are enlarged outwards and giving the appearance of protruding nail-heads, 2–3 μ long and 2 μ broad; paraphyses strongly enlarged above.

On cow dung.

TYPE LOCALITY: Near Harrington Sound, Bermuda.

DISTRIBUTION: Known only from the type locality.

The present species seems to differ from *A. sarcobius* Boud. in the larger size of the spores and the difference in their markings. Both species were collected in the same region. It is possible that further field study will show the present species to be only an extreme form of *A. sarcobius*. If so, the description and illustrations of that species are incorrect.

Ascophanus granuliformis (Cr.) Boud. On excrement of cows.

Ascobolus stercorarius (Bull.) Schröt. On the excrement of cows.

Ascobolus immersus Pers. On the excrement of cows and horses.

Saccobolus Kerverni (Cr.) Boud. On the excrement of cows and horses.

Lasiobolus equinus (Müll.) Karst. On excrement of various kinds.

Thecotheus Pelletieri (Cr.) Boud. On excrement of horses.

Pyronema omphalodes (Bull.) Fuckel. On damp soil where fires have been.

Sarcoscypha minuscula Boud. & Torrend. On dead foliage of Bermuda cedar.

Erinella rhaphidophora (Berk. & Curt.) Sacc. On old wood.

Gorgoniceps Pumilionis Rehm. On decaying wood.

Orbilia chrysocoma (Bull.) Sacc. On an old pasteboard box.

Dasyscypha earoleuca Berk. & Br. On decaying wood.

Patellaria atrata (Hedw.) Fries. On dead and decaying corn-stalks.

Karschia lignyota (Fries) Sacc. On decaying wood.

HYSTERIALES

Hysterographium lineolatum (Cooke) Sacc. On old trunks of *Sabal Blackburnianum*.

Hysterographium praelongum (Schw.) Sacc. On dead wood.

PHACIDIALES

Propolis faginea (Schröt.) Karst. On old wood of various kinds.

Stictis radiata (L.) Pers. On old wood and herbaceous stems.

Stictis graminum Desm. Parasitic on stems of various grasses.

PERISPORIALES

Dimerosporium melioloides (Berk. & Curt.) Ellis & Ev. On living leaves of *Baccharis*.

Meliola Cookeana Speg. On living leaves of *Lippia*.

Meliola circinans Earle. On living leaves of saw-grass, *Mariscus jamaicensis*.

Asterina pelliculosa Berk. Reported by the Challenger Expedition on coffee leaves.

HYPOCREALES

Cordyceps militaris (L.) Link. On the pupa of an insect.

Hypocrea patella Cooke & Peck. On dead twigs of Bermuda cedar.

Sphaerostilbe flammea (Berk. & Rav.) Tul. On bark associated with scale insects.

Stilbocrea hypocreoides (Kalch. & Cooke) Seaver. On bark of various kinds.

Nectria sanguinea (Bolton) Fries. On dead wood.

Nectria Lantanae sp. nov.

Perithecia superficial, minute, scattered, at first globose, collapsing when dry, smooth or only minutely rough, pale orange, often fading to nearly white in dried specimens; asci cylindric or subcylindric, 8-spored; spores ellipsoid, 1-septate, hyaline; paraphyses indistinct.

On dead leaves of *Lantana odorata*.

TYPE LOCALITY: Near Harrington Sound, Bermuda.

DISTRIBUTION: Known only from the type locality.

Calonectria Umbelliferarum sp. nov.

Perithecia superficial, scattered or gregarious, occasionally slightly crowded, globose or subglobose, collapsing when dry and becoming pezizoid, bright reddish, often becoming dull when dry, smooth or minutely rough; asci clavate, reaching a length of 75 μ and a diameter of 10 μ, 8-spored; spores usually slightly curved, attenuated at the ends, becoming 3-septate, reaching a length of 20–25 μ and a diameter of 4 μ; paraphyses indistinct.

On dead stems of *Foeniculum Foeniculum*.

TYPE LOCALITY: Near Harrington Sound, Bermuda.

DISTRIBUTION: Known only from the type locality.

Calonectria granulosa sp. nov.

Perithecia scattered, gregarious or occasionally crowded together in small clusters, minute, globose or subglobose, occasionally collapsing, strongly granulose, bright red, finally fading to pale yellow; asci clavate, 8-spored, reaching a length of 60 μ and a diameter of 10 μ; spores partially 2-seriate, ellipsoid, with the ends strongly narrowed, becoming 1-septate, finally 3-septate, hyaline, reaching a length of 14–15 μ and a diameter of 4–6 μ, occasionally slightly constricted at the middle septum.

On dead stems of *Jasminum*.

TYPE LOCALITY: Near Harrington Sound, Bermuda.

DISTRIBUTION: Known only from the type locality.

FIMETARIALES

Fimetaria fimicola (Rob.) D. Griff. & Seaver. On excrement of cows.

Fimetaria hyalina (D. Griff.) D. Griff. & Seaver. On the excrement of cows.

Pleurage fimiseda (Ces. & De-Not.) D. Griff. On the excrement of cows.

Pleurage anserina (Ces.) Kuntze. On the excrement of cows.

Pleurage vestita (Zopf) D. Griff. On the excrement of cows.

Sporormia minima Auersw. On the excrement of cows.

Sporormia intermedia Auersw. On the excrement of cows.

Chaetomium sp. On the excrement of rats.

SPHAERIALES

Rosellinia mammaeformis (Pers.) Ces. & De-Not. Reported by the Challenger Expedition.

Rosellinia subiculata (Schw.) Sacc. On old wood of various kinds.

Lasiosphaeria pezizula (Berk. & Curt.) Sacc. On decaying wood.

Hypoxylon multiforme Fries. Reported by the Challenger Expedition.

Hypoxylon investiens (Schw.) Berk. On rotten wood.

Hypoxylon fuscum (Pers.) Fries. On decaying wood.

Hypoxylon fuscopurpureum (Schw.) Berk. On old wood.

Nummularia Bulliardi Tul. On rotten wood.

Daldinia concentrica (Bolton) Ces. & De-Not. Reported by the Challenger Expedition.

Xylaria filiformis (Alb. & Schw.) Fries. On dead leaves of *Jasminum*.

Xylaria arbuscula Sacc. On sticks and rotten wood.
Poronia Oedipus Mont. On the excrement of cows.
Ophiobolus acuminatus (Sow.) Duby. On old corn-stalks.

Fungi Imperfecti

Helminthosporium Ravenelii Berk. & Curt. Parasitic on *Sporobolus angustus.*
Septoria oleandrina Sacc. Parasitic on leaves of *Oleander.*
Phyllosticta Ipomoeae Ellis & Kellerm. Parasitic on leaves of *Ipomoea.*
Phyllosticta Opuntiae Sacc. & Speg. Parasitic on *Opuntia.*
Phoma Fourcroyae Thüm. Parasitic on leaves of *Fourcroya macrophylla.*
Phoma leguminum West. On old pods of *Lonchocarpus violaceus.*
Phoma Musarum Cooke. On petioles of banana leaves.
Pestalozzia Guepini Desm. Parasitic on leaves of *Rhizophora Mangle.*
Macrosporium Solani Ellis & Martin. On old stems and leaves of potato, *Solanum tuberosum.*
Sclerotium Semen Tode. On dead leaves of some grass.
Isaria felina (DC.) Sacc. On excrement of rats.
Stysanus Stemonites fimetarius Karst. On excrement of rats.
Tetraploa aristata Berk. & Br. On old wood.
Helicoma larvula Morgan. On old stems of *Sabal Blackburnianum.*

Ustilaginales

Ustilago Zeae (Beckm.) Unger. On corn, *Zea Mays.*

Uredinales

Nigredo proeminens (DC.) Arthur. On leaves of *Poinsettia heterophylla, Chamaesyce Blodgettii, Chamaesyce hyssopifolia, Chamaesyce prostrata.*
Nigredo Medicaginis (Pass.) Arthur. On leaves of *Medicago denticulata.*
Puccinia Lantanae Farlow. On leaves of *Lantana odorata.*
Puccinia Dichondrae Mont. On leaves of *Dichondra carolinensis.*
Puccinia Cladii Ellis & Tracy. On leaves of saw grass, *Mariscus jamaicensis.*
Puccinia Polygoni-amphibii Pers. On leaves of *Persicaria punctata.*

Puccinia purpurea Cooke. On leaves of sugar cane, *Saccharum officinarum*.

Tranzschelia punctata (Pers.) Arthur. On leaves of cultivated peach.

Gymnosporangium bermudianum (Farlow) Earle. On foliage of *Juniperus barbadensis*.

AGARICALES

Agaricus alphitophorus Berk. On small twigs. Reported by the Challenger Expedition.

Agaricus arvensis Schaeff. On the ground in pastures.

Agaricus corticola Schum. On dead wood. Reported by the Challenger Expedition.

Agaricus helictus Berk. On rotten leaf mould. Reported by the Challenger Expedition.

Agaricus rhodocylix Lasch. On the ground. Reported by the Challenger Expedition.

Agaricus tener Schaeff. On the ground. Reported by the Challenger Expedition?

Coprinus ephemerus Fries. On the excrement of animals.

Coprinus fimetarius Fries. On the excrement of animals.

Coriolus pavonius (Hook.) Murrill. On deciduous logs.

Coriolus sericeohirsutus (Klotzsch) Murrill. On dead branches of cedar.

Crinipellis stupparia (Berk. & Curt.) Pat. On fallen dead sticks.

Daedalea Aesculi (Schw.) Murrill. On dead trunks of deciduous trees.

Fomes Sagraeanus (Mont.) Murrill. On dead logs and stumps.

Gymnopilus penetrans (Fries) Murrill. On dead wood.

Hirneola coffeicolor Berk. On coffee bark. Reported by the Challenger Expedition.

Hydrocybe Cantharellus (Schw.) Murrill. On the ground.

Hydrocybe conica (Scop.) P. Karst. On the ground.

Lepiota naucina (Fries) Quél. On the ground.

Marasmius bermudensis Berk. On dead coffee wood. Reported by the Challenger Expedition.

Marasmius minutus Peck. On fallen leaves.

Marasmius obscurus Berk. & Br. Reported by the Challenger Expedition.

Marasmius Sabali Berk. On leaf-stalks of *Sabal*. Reported by the Challenger Expedition.

Marasmius praedecurrens Murrill. Among mosses and sticks.
Panaeolus campanulatus L. On the excrement of animals.
Pleurotopsis niduliformis Murrill. On fallen twigs of cedar.
Polyporus obliquus Fries. On dead sticks. Reported by the Challenger Expedition.
Polyporus arcularius Fries. On dead sticks. Reported by the Challenger Expedition.
Schizophyllus alneus (L.) Schröt. On dead wood.
Stereum hirsutum (Willd.) Fries. On dead branches.
Stereum radians Fries. On old wood.
Tyromyces graminicola Murrill. On a tuft of grass.

Lycoperdales

Clathrus sp. On the ground.
Geaster saccatus Fries. On the ground.